

WHAT IS CLAIMED IS:

1. A photovoltaic device comprising:

a photoelectric conversion layer receiving light
5 incident from the front surface side; and

a transparent conductive film, formed on the front
surface of said photoelectric conversion layer, including
an indium oxide layer having (222) plane orientation with
two (222) peaks in said indium oxide layer.

10

2. The photovoltaic device according to claim 1,
further comprising a semiconductor layer, formed thereon
with said transparent conductive film, consisting of at
least either an amorphous semiconductor or a
15 microcrystalline semiconductor.

3. The photovoltaic device according to claim 1,
wherein

said (222) peaks in said indium oxide layer include:

20 a first peak having an angle 2θ (θ : X-ray diffraction
angle) of about 30.1 ± 0.1 degrees, and

a second peak having an angle 2θ (θ : X-ray
diffraction angle) of about 30.6 ± 0.1 degrees.

25 4. The photovoltaic device according to claim 3,

wherein

the ratio (I_1/I_2) of the intensity (I_1) of said first peak to the intensity (I_2) of said second peak is at least about 0.07 and not more than about 0.9.

5

5. The photovoltaic device according to claim 4,
wherein

the ratio (I_1/I_2) of the intensity (I_1) of said first peak to the intensity (I_2) of said second peak is at least
10 about 0.25 and not more than about 0.75.

6. The photovoltaic device according to claim 1,
wherein

said indium oxide layer contains Sn.
15

7. The photovoltaic device according to claim 6,
wherein

the content of Sn with respect to In in said indium oxide layer is at least about 1 percent by weight and not
20 more than about 10 percent by weight.

8. A photovoltaic device comprising:

a first conductivity type crystalline semiconductor substrate having a front surface and a back surface and
25 receiving light incident from the side of said front

surface;

a substantially intrinsic first amorphous semiconductor layer formed on said front surface of said crystalline semiconductor substrate;

5 a second conductivity type second amorphous semiconductor layer formed on said first amorphous semiconductor layer; and

a transparent conductive film, formed on said second amorphous semiconductor layer, including an indium oxide layer having (222) plane orientation with two (222) peaks
10 in said indium oxide layer.

9. The photovoltaic device according to claim 8, wherein

15 said (222) peaks in said indium oxide layer include:
a first peak having an angle 2θ (θ : X-ray diffraction angle) of about 30.1 ± 0.1 degrees, and
a second peak having an angle 2θ (θ : X-ray diffraction angle) of about 30.6 ± 0.1 degrees.

20

10. The photovoltaic device according to claim 9, wherein

the ratio (I_1/I_2) of the intensity (I_1) of said first peak to the intensity (I_2) of said second peak is at least
25 about 0.07 and not more than about 0.9.

11. The photovoltaic device according to claim 10,
wherein

the ratio (I_1/I_2) of the intensity (I_1) of said first
5 peak to the intensity (I_2) of said second peak is at least
about 0.25 and not more than about 0.75.

12. The photovoltaic device according to claim 8,
wherein

10 said indium oxide layer contains Sn.

13. The photovoltaic device according to claim 12,
wherein

the content of Sn with respect to In in said indium
15 oxide layer is at least about 1 percent by weight and not
more than about 10 percent by weight.

14. The photovoltaic device according to claim 8,
wherein

20 said crystalline semiconductor substrate is an n-type
semiconductor substrate, and said second amorphous
semiconductor layer is a p-type semiconductor layer.

15. A device having a transparent conductive film,
25 comprising:

a substrate; and

a transparent conductive film, formed on said substrate, including an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer.

16. The device having a transparent conductive film according to claim 15, wherein

said (222) peaks in said indium oxide layer include:

a first peak having an angle 2θ (θ : X-ray diffraction angle) of about 30.1 ± 0.1 degrees, and

a second peak having an angle 2θ (θ : X-ray diffraction angle) of about 30.6 ± 0.1 degrees.

17. The device having a transparent conductive film according to claim 15, wherein

said indium oxide layer contains Sn.

18. The device having a transparent conductive film according to claim 17, wherein

the content of Sn with respect to In in said indium oxide layer is at least about 1 percent by weight and not more than about 10 percent by weight.

19. A photovoltaic device comprising:

a first conductivity type single-crystalline silicon substrate having a front surface and a back surface and receiving light on the side of said front surface;

5 a substantially intrinsic first amorphous silicon layer formed on said front surface of said single-crystalline silicon substrate;

a second conductivity type second amorphous silicon layer formed on said first amorphous silicon layer; and

10 a transparent conductive film, formed on said second amorphous silicon layer, including an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer.

15 20. The photovoltaic device according to claim 19, wherein

said (222) peaks in said indium oxide layer include:

a first peak having an angle 2θ (θ : X-ray diffraction angle) of about 30.1 ± 0.1 degrees, and

20 a second peak having an angle 2θ (θ : X-ray diffraction angle) of about 30.6 ± 0.1 degrees.